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Analysis of Energy Certification  
Compliance for urban  
sustainability of public buildings  
in England and Wales [Winner :  
RISE Awards 2019 Highly  
Commended certificate for  
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Osaji, EE

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# ANALYSIS OF ENERGY CERTIFICATION COMPLIANCE FOR URBAN SUSTAINABILITY OF PUBLIC BUILDINGS IN ENGLAND & WALES

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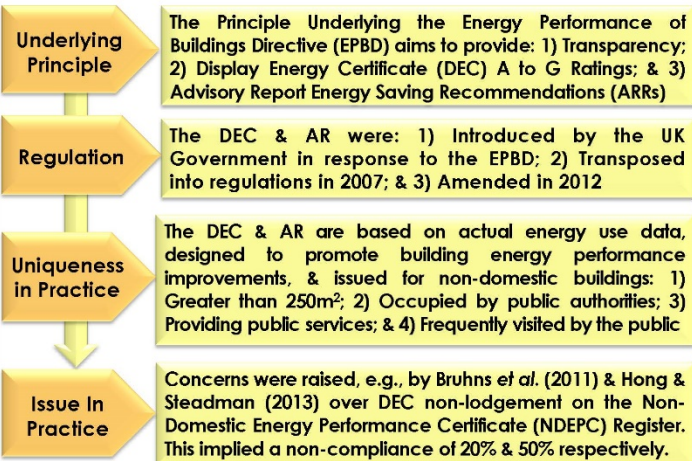
## MOTIVATION

This DEng research is inspired by the candidate's exploratory studies of Global Building Energy & Environmental Assessment Certification (BEEAC) tools, & UK's laudable Energy Certification tools. The UK's Display Energy Certificate (DEC) & Advisory Report (AR) tools are uniquely based on actual energy use data but plagued by compliance issues.

*The candidate believes Energy Certification Compliance is attainable if reengineered via rigorous process-flow-&-flow data capture & analyses.*

The candidate's ability to undertake this DEng research is enriched by expertise gained from his roles such as: (1) Treasurer of CIBSE Energy Performance Group; (2) Director of Carbon Bites; (3) Vice-Chair of CIBSE ASHRAE Group; (4) Fellow of Leeds Sustainability Institute; (5) Academician of Academy of Urbanism; (6) Fellow of Royal Society of Arts; (7) Energy Globe Ambassador to UK; (8) Fellow of Forum for Built Environment; (9) Chartered Scientist; & (10) Chartered Environmentalist.

## BACKGROUND, CONTEXT & ISSUE



## DEC & AR PROCESS-FLOW & PROCESS-FLAW PHASES



## THE AIM & OBJECTIVES

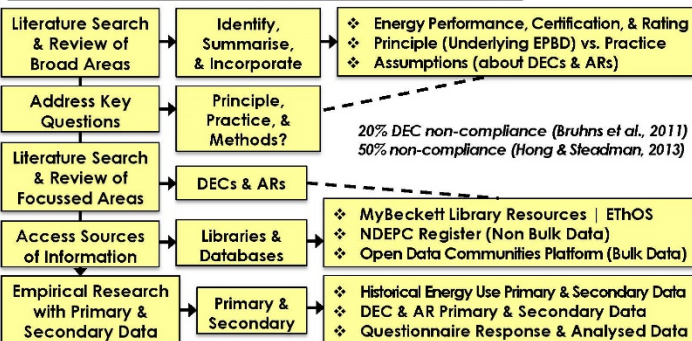
The Aim:

- ❖ To analyse compliance with the DEC & AR principle for Urban Sustainability of Public Buildings in England & Wales

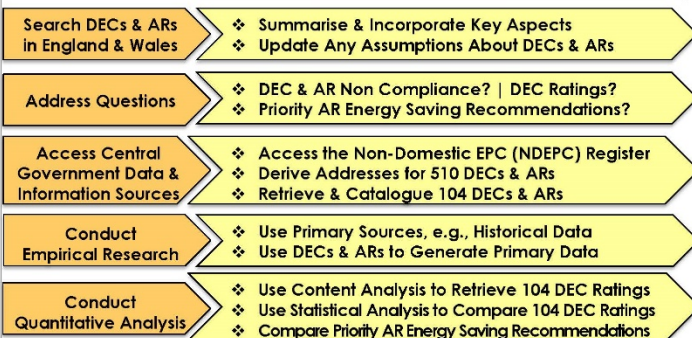
The Objectives:

1. To determine the extent of compliance by UK Central Government buildings
2. To determine the extent of compliance by England & Wales Local Governments
3. To determine what attributes & trends characterise compliance in England & Wales
4. To determine why the issue occurs & how to solve it to improve principle & practice

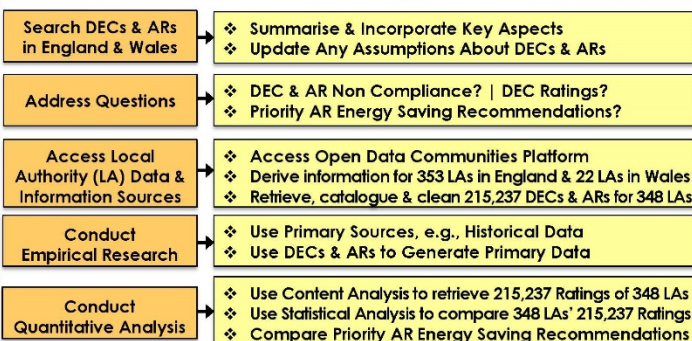
## PROTOCOL FOR THE LITERATURE SEARCH & REVIEW



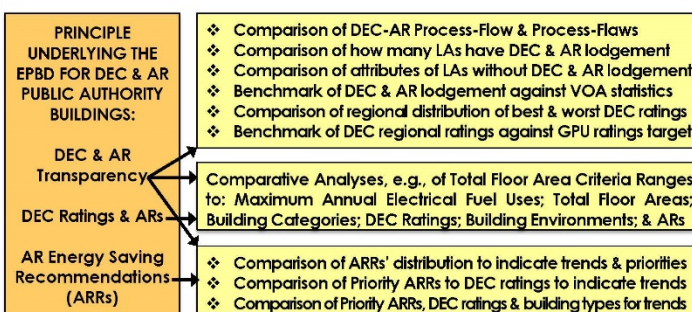
## PROTOCOL FOR QUANTITATIVE ANALYSIS OF CENTRAL GOVERNMENT DEC'S & ARS



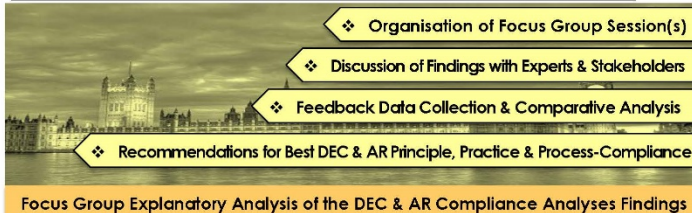
## PROTOCOL FOR QUANTITATIVE ANALYSIS OF LOCAL GOVERNMENT DEC'S & ARS



## PROTOCOL FOR COMPARATIVE ANALYSIS OF DEC & AR ATTRIBUTES & TRENDS



## PROTOCOL FOR THE FOCUS GROUP EXPLANATORY ANALYSIS





# ANALYSIS OF ENERGY CERTIFICATION COMPLIANCE FOR URBAN SUSTAINABILITY OF PUBLIC BUILDINGS IN ENGLAND & WALES

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## COMPARISON OF UK CENTRAL GOVERNMENT DEC RATINGS

DEC Ratings	A (Best)	B	C	D	E	F	G (Worst)	N/A
No. of Buildings	0	6	14	24	24	11	25	406

## UK CENTRAL GOVERNMENT DEC & AR NON-COMPLIANCE

No. of UK Central Government Buildings	510
No. of Unavailable DEC & ARs	406
No. of Available DEC & ARs	104
Level of Non-Compliance	≈ 80%

- ❖ The project discovered 510 UK Central Government buildings & that 80% had DEC & AR non-lodgement on the NDEPC Register, i.e., non-compliance
- ❖ The project discovered the percentages of DEC A to G ratings for the 104 UK Central Government buildings as: 0%; 6%; 13%; 23%; 23%; 11%; & 24%
- ❖ The project discovered six UK Central Government building types & their DEC ratings that were mostly: D for Agencies & Other Public Bodies; D for the Prime Minister's Office; E for Ministerial Departments; E & F for Public Corporations; G for High Profile Groups; & G for Non-Ministerial Departments

## UK CENTRAL GOVERNMENT DEC RATINGS VS. THE GPU 2018 TARGET

DEC Ratings	A	B	C	D	E	F	G
Government Property Unit 2018 Target	A	B	C	D			
No. of Buildings	0	6	14	24	24	11	25
Total likely to meet target	44 (i.e. ≈ 42%)						

- ❖ The project discovered that only about 42% of the 104 UK Central Government buildings attained a Government Property Unit (GPU) target of DEC A to D ratings by 2018. About 58% did not attain the GPU 2018 target.
- ❖ The project discovered that B-rated (best performing) UK Central Government buildings had: (1) Biomass as the most frequent Main Heating Fuel; & (2) Heating & Natural Ventilation as the most frequent Building Environment

## NORTHERN ENGLAND LGA DEC RATINGS VS GPU 2018 TARGET

Northern England	No. of LGAs	Percentage Distribution of Lodged DEC & ARs Rated A (Best Performing) to G (Worst Performing)						
		Approximate %						
		A	B	C	D	E	F	G
North East	13	1%	6%	24%	37%	20%	7%	5%
North West	40	1%	5%	20%	38%	24%	8%	5%
Yorkshire & Humber	23	1%	6%	20%	35%	24%	9%	6%

- ❖ The project discovered that a Government Property Unit (GPU) 2018 target of DEC A to D ratings was not attained in Northern England by about: 32% of North East DEC & ARs; 37% of North West DEC & ARs; & 39% of Yorkshire & Humber DEC & ARs
- ❖ The project discovered that most of the Northern England DEC & ARs were D-rated

## NORTHERN ENGLAND DEC & AR LODGEMENT: IF BENCHMARKED

Description	North East	North West	Yorkshire & Humber	Total
Non-Domestic Rating Stock of Properties	83,490	266,120	192,830	542,440
No. of DEC & AR Lodgement	11,155	29,617	22,659	63,431
Non-Lodgement	72,335	236,503	170,171	479,009
% of Non-Lodgement	87%	89%	88%	88%

- ❖ The project discovered the percentages of DEC & AR non-lodgement for the North East (NE), North West (NW), & Yorkshire & Humber (Y & H) were about 87%, 89%, & 88% respectively, if benchmarked against Valuation Office Agency's statistics on non-domestic rating stock of properties.

## UK CENTRAL GOVERNMENT DEC RATINGS PER BUILDING TYPE

UK Central Govt. Bldg. Type	No.	DEC Ratings						
		A	B	C	D	E	F	G
Agencies & Other Public Bodies	62							
High Profile Groups	7							
Ministerial Departments	17							
Non-Ministerial Departments	15							
Prime Minister's Office	1							
Public Corporations	2							

## UK CENTRAL GOVERNMENT PRIORITY AR RECOMMENDATIONS

Priority AR Recommendations For DEC G Ratings	No.
Expert assessment of AC systems in accordance with CIBSE TM 44	10
Specific measures to reduce hot water wastage	10
Automated controls & monitoring systems to electrical equipment	9
Energy management techniques introduction	9
Expert review of lighting strategies for upgrades & implementation plan	9
Regular inspections of the building fabric to check on insulation	6

- ❖ The project discovered 36 Priority AR Recommendations (PARRs) based on frequency of occurrence & energy savings potential in 25 DEC G-rated UK Central Government buildings. The most frequent PARRs were: (1) Expert assessment of AC systems in accordance with CIBSE TM 44; & (2) Specific measures to reduce hot water wastage. The least frequent PARRs included: (1) Expert review of building fabric & its airtightness for improvements.

- ❖ 'Fabric First' approach did not seem to be prioritised as much as other PARRs

## ENGLAND & WALES LGA DEC & AR NON-COMPLIANCE

Number of Local Government Authorities (LGAs) in England	353
Number of Local Government Authorities in Wales	22
Total Number of LGAs in England & Wales	375
Number of LGAs in England & Wales with DEC & ARs	348
Level of Non-Compliance	7.2 %

- ❖ The project discovered that 7.2% of the 375 England & Wales LGAs had DEC & AR non-lodgement on the OpenDataCommunities Platform
- ❖ None of the 22 Wales LGAs had non-lodgement. However, 27 (about 7.65%) of the 353 England LGAs apparently had non-lodgement

- ❖ The project discovered the DEC & AR Process-Flow & categorised it into 7 Phases as: (1) Underlying Principle; (2) Pre-Commission; (3) Commission; (4) Lodgement; (5) Quality Assurance Enforcement; (6) Availability/Quality Complaints; & (7) Renewal Commission. The project discovered that Process-Flaws occur in Phases 2, 3, 4, & 7.

- ❖ The project discovered attributes for Best Performing Public Authority Buildings (via Comparative Analyses, e.g., of Total Floor Area Criteria Ranges to: Maximum Annual Electrical Fuel Uses; Total Floor Areas; Building Categories; DEC Ratings; & Building Environments). These will lead to Baseline Profiles for: Benchmarking; What-If Scenario Simulations; Focus Group Explanatory Analyses; & Recommendations for Best DEC & AR Principle, Practice & Process-Compliance.

- ❖ This project is the 1st ever independent synthesis of the key data, e.g., on: pp.34-35 at [www.cibsejournal.com/archive/PDFs/CIBSE-Journal-2017-12.pdf](http://www.cibsejournal.com/archive/PDFs/CIBSE-Journal-2017-12.pdf) pp.532-553 at [www.leedsbeckett.ac.uk/as/cebe/seeds/seeds2017\\_proceedings.pdf](http://www.leedsbeckett.ac.uk/as/cebe/seeds/seeds2017_proceedings.pdf) [www.youtube.com/watch?v=W6KC5k47YiY](http://www.youtube.com/watch?v=W6KC5k47YiY)